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ABSTRACT

Online information retrieval is pervasive and its development in libraries is accelerating. Within the near future, most college and research libraries will provide direct access to their patrons to vast information resources via CD-ROMs, locally mounted databases, and gateways. The computer terminal and the "frame" of information it provides will take its place as a perceptual icon the user identifies with information and its acquisition. Although online retrieval is very powerful, it is also quite abstract, and hence will present perceptual problems to the user. A key to resolving the perceptual problem will be understanding the nature of algorithmic problem solving. It is through the algorithm that natural logic to formal logic transformation occurs during interactive searching. Since the algorithm is of such importance, this paper examines both its intrinsic value to online retrieval and its inherent problematic nature. Included is the notion of the algorithm as a "natural barrier" to the heuristic-oriented searcher. (19 references) (Author)

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CONTINUITY IN AN ENVIRONMENT OF PERCEPTUAL DISCONTINUITY: THE SIGNIFICANCE OF THE ALGORITHM IN EXPLOITATIVE POWER

by

Peter J. Vigil

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CONTINUITY IN AN ENVIRONMENT OF PERCEPTUAL DISCONTINUITY: THE SIGNIFICANCE OF THE ALGORITHM IN EXPLOITATIVE POWER

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Keywords: Algorithms, Philosophy, Education, Perception, Online Retrieval, Icons.

Abstract: Online information retrieval is pervasive and its development in libraries is accelerating. Within the near future, most college and research libraries will provide direct access to its patrons to vast information resources via CD-ROMS, locally mounted databases, and gateways. The computer terminal and the "frame" of information it provides will take its place as a perceptual icon the user identifies with information and its acquisition. Although online retrieval is very powerful it is also quite abstract, and hence will present perceptual problems for the user. A key to resolving the perceptual problem will be understanding the nature of algorithmic problem solving. It is through the algorithm that natural logic to formal logic transformation occurs during interactive searching. Since the algorithm is of such importance, this paper will examine both its intrinsic value to online retrieval and its inherent problematic nature. Included, will be the notion of the algorithm as a "natural barrier" to the heuristic oriented searcher.

1. INTRODUCTION

Computerized retrieval is rapidly changing how information is obtained. Accordingly, the effect is transforming college and research libraries, as we move "Toward Paperless Information Systems" (1). A new literacy is required as the perceptual icons of the past, library buildings, card catalogs, and print are being replaced by computer screens and the "frames" of information they display.

Two primary concepts are foundations of the library and information science profession. These foundations are Cutter's power of specificity (2), and Ranganathan's power of synthesis (3). Both have been described in Wilson's TWO KINDS OF POWER as descriptive and exploitative (4).

On a fundamental level, descriptive power is the objective (more or less) function within the library to describe collections. A good example of this is the author/title catalog. Descriptive power has it's strength in

identifying the known item. Exploitative power on the other hand, is much more problematic and relates to a users need to find information on a topic. It involves the subjective interpretation of the users perspective of the topic, interpretation of the information that relates to the topic, and, of course, how the provider, i.e., library and information industry, interprets these same things.

Historically, there has been great success in the application of descriptive power, but frustration in the pursuit of its counterpart, exploitation. This is, of course, due to the highly subjective nature of the task with its intrinsic and problematic relationship to fuzzy set theory. The computer now provides a means for profound applications for both powers.

There is quite a bit that can be said on all of this, but the focus to be made here concerns the realization of Rangnathan's concept of synthesis with the power that computing provides through post-coordinate searching. In other words the ability to mix topics, or more technically, combine sets through online interaction. The human computer interface (HCI) however, engenders the user in an environment of perceptual discontinuity (5).

Online searching puts the user in a totally unique situation, where new skills and a new perception are required to be successful. The user must now think in terms of formal logic, and they must incorporate an algorithmic problem solving approach to their task. Heuristics are not enough, and the erstwhile usefulness of "subjective probability" (6) which is so much a part of "common sense" will only defeat their purpose, as the information retrieval task takes on complexity.

Online retrieval does indeed provide great power, but it also presents significant problems for users. It is evident two paths can be taken. The user can be trained in the art and science of searching, provided with the algorithmic based principles to exploit online systems successfully; or we will build this expertise into the system, vis-a-vis, the "expert system" (7). Although, both will occur in time, the immediate mandate is education for both librarians as well as users into the nature and significance of algorithmic problem solving (8).

2. A NEW SYMBOLISM

What exactly will be the demand of the library community as the world of information is delivered through a computer terminal? To a certain extent bibliographic instruction will remain as it has been with a discourse on reference tools, comparisons of secondary sources, and strategy for using these resources. What will be new is the knowledge to interrogate a file, to understand the complexities of Boolean logic, the notion of the incompatibility of computer specificity and nature's subjectivity; and most important of all the concept of the algorithm as a means to bridge the two.

It will involve teaching the user to understand the power that the computer provides, a device that changes the perspective of how the world can be observed. A computer does, indeed, change the scale of observation, and has been referred to as a "scalar device" (9). In no area of application is this more apparent than in the transformation of data into information, through online retrieval.

Hofstadter's theme in GODEL, ESCHER, BACH (10), is that recursion is the link between the artificial and the natural, a repetitive process that upon each iteration makes a closer approximation of an artificial representation to a natural phenomenon. In engineering for example it's the use of the calculus to represent the action of waves and fluids, and in online searching it's the series of Boolean expressed search statements to represent a concept.

It is one thing to conceptualize the world's literature online, and not just the references, but the text itself, it's quite another to conceptualize the means to search through this massive collection of databases, files, records, and fields to find the information that meet one's needs. The new symbolism requires the realization that the process is just as significant as the processed. McLuhan's "The Medium is the Message," says it all (11). The power lies not just in the information sought, but in the means to acquire it - online retrieval.

3. AN ENVIRONMENT OF DISCONTINUITY

The user who receives their information from a terminal screen, who works with "frames" of information is in a totally different environment from the way they obtained information in the past (5). The perceptual discontinuity occurs at two levels. First of all, is the means of obtaining the "frame" itself, the negotiation of a search with a database through a mathematically based dialogue. Where once the user could rely almost exclusively on their heuristic problem solving skills, the limiting factor is now algorithmic and interpretation is ordinal to cardinal, and probabilistic based; from individual items to sets.

Compounding the problem is the disorientation that comes from viewing the information from a screen. Rows of catalogs are gone from which the user can make their points of reference. No longer can the user remember the cabinet in the corner, the drawer on the bottom and the cards about a third of the way from the front! In other words the physical things that go into making mental clues and continuity for associations are gone. Now they have the screen, its frame, and the "scalar" power of exploitation it provides.

The tradeoff is a significant one. It is likely that the transition will be a difficult one for both user and libraries. Online searching experts are a premium and their numbers few (12). Even fewer are those who can teach what they know! For a library environment that in the very near future will have direct access to exploitative power to its

patrons, the potential problem will increase by orders of magnitude.

4. ACHIEVING CONTINUITY

The past and the future of library and information science can be characterized by the powers of description and exploitation respectively. Cutter gave the profession its pragmatic start, Rangnathan its dream, and the digital computer the engine to make this dream come true. A major agenda item for the future will concern education (13,14). There are many who believe the user-friendly, expert systems will resolve the problem of information retrieval. Perhaps this will occur in time, but not in the near future, perhaps not ever. (15).

A user seeking information on a topic is separated from their concept and can never define it exactly accordingly to the laws of cybernetics (16). They can only approach it. The problem with user friendly, expert systems, that attempt to interpret a users query and translate it into a formal logic, Boolean based query, is that it makes this distance even further. This is not to say that user-friendly, expert systems have no place, but that they be viewed as a means and not the end. The design must be one that is affective as well as effective. One that modifies the user's behavior so that they become knowledgeable of the means to make natural logic to formal logic expressions.

In the meantime, it will be up to the information professionals to understand the nature of the algorithm, its cognitive dynamics in online retrieval (17) and the "natural barrier" which separates the human from this concept (18). This barrier can only be overcome with education, just as problem solving is not an innate human characteristic and must be acquired (12).

There is a challenge before us with many dimensions. It is dealing with accelerating complexity and promoting skills to exploit the systems of a society that is going online (19)!

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